

Brown Dwarf Variability: What's Varying and Why?

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Surveys by ground based telescopes, HST, and Spitzer have revealed that brown dwarfs of most spectral classes exhibit variability. The spectral and temporal signatures of the variability are complex and apparently defy simplistic classification which complicates efforts to model the changes. Important questions include understanding if clearings are forming in an otherwise uniform cloud deck or if thermal perturbations, perhaps associated with breaking gravity waves, are responsible. If clouds are responsible how long does it take for the atmospheric thermal profile to relax from a hot cloudy to a cooler cloudless state? If thermal perturbations are responsible then what atmospheric layers are varying? How do the observed variability timescales compare to atmospheric radiative, chemical, and dynamical timescales? I will address such questions by presenting modeling results for time-varying partly cloudy atmospheres and explore the importance of various atmospheric processes over the relevant timescales for brown dwarfs of a range of effective temperatures. Regardless of the origin of the observed variability, the complexity seen in the atmospheres of the field dwarfs hints at the variability that we may encounter in the next few years in directly imaged young Jupiters. Thus understanding the nature of variability in the field dwarfs, including sensitivity to gravity and metallicity, is of particular importance for exoplanet characterization.